

Scale Intertidal Biota

Spatial Patterns of Intertidal Biological Communities in Central and South Sound.

Scientists with the Nearshore Habitat Program in Natural Resources have been studying intertidal biological communities in Puget Sound since 1997. The project goals are: 1) to collect baseline information on community patterns in Puget Sound; 2) to determine if the intertidal biological community is a suitable indicator of habitat condition for PSAMP; and 3) to provide large-scale, contextual information for comparison to more detailed studies. The biological community monitoring project samples organisms living on and in the substrate in the lower intertidal zone. In 1997, samples were collected in Carr Inlet. Since then, the geographic extent of the project has gradually expanded to include Case Inlet, Budd Inlet and Central Sound (Figure 1). Results from this work reveal spatial patterns and temporal trends in community structure. They also bring important considerations to light for groups who are considering monitoring biological communities:



- Species richness (the number of species present at a site) is a common measure of habitat condition. In Puget Sound, this study documented striking gradients in species richness over large spatial areas. Species richness was generally three times greater in the north, as shown by comparison of pebble beaches sampled between Olympia and southern Whidbey Island. Transitions in species abundance along this gradient were gradual as opposed to abrupt, suggesting that the "basins" of Puget Sound represent parts of a continuum. These patterns were shown in both the surface biota and the infauna.
- Inter-annual variation in biota is high. However, while temporal variation within the organisms on a beach is found from one year to the next, similar beaches within an area tend to change in the same ways and remain similar to each other. This finding has an importation implication for other studies: studies that compare multiple sites in order to gauge habitat condition need to pick similar sites that are nearby and compare data from the same year as much as possible.
- Comparison of recent surveys to historic surveys suggests that change has occurred at some sites. Data from the Central Sound were compared qualitatively to historic surveys from the 1970s and 1980s to assess whether there had been major shifts in the communities over time. In general, the historic surveys showed a high degree of overlap in flora and fauna. One exception was found in the beaches near Point Wells. Many taxa found in the historic surveys from these sites were conspicuously missing from the recent surveys. Additionally, these beaches had lower richness and fewer juvenile clams compared to recent surveys of sites to the north and south. Possible causes of these absences include nearby pollution, other anthropogenic influences, or unusual substrate conditions.
- Samples of different habitat types reveal broad patterns in biotic communities that relate to physical conditions. For example, a total of 197 invertebrate and algal species were found in 1998. Mud beaches had the most species overall (91), followed by pebble (81), cobble (73) and sand (59). The average number of species per habitat type was highest for complex substrates including pebble (14.0) and cobble (8.5), and lowest for sand (3.5) and mud (6.2). These findings can be used to select the best habitat types to monitor, and to provide context for other studies. Generally, change detection is most likely to be successful in habitat types that have both high diversity and high uniformity.

- Because we lack the resources to sample biological communities everywhere, managers would like to be able to extrapolate data collected at sampled beaches to unsampled sites. In the event of a localized impact, such as an oil spill, the effects of that spill could then be assessed via detailed sampling of physically similar beaches that were not impacted. A goal of this study was to successfully extrapolate biological community results to unsampled beaches. It approached this goal by randomly selecting beaches and classifying their physical characteristics in detail. It then tested this goal by selecting additional beaches and comparing them. It found that the organisms on the new beaches were very similar (statistically indistinguishable) from those beaches already sampled. This means that, in the case of an oil spill or other accident, the data would illustrate (with high statistical confidence) the biota that should have been on the beach before the spill.

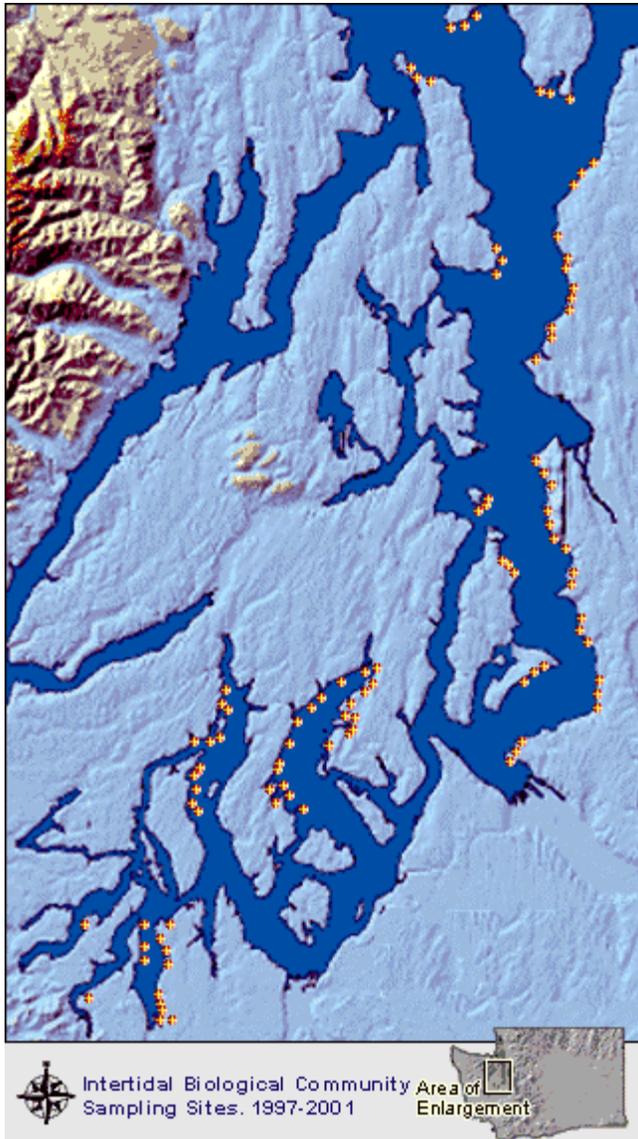


Figure 1. Intertidal biological community sampling sites. Source: Department of Natural Resources.

The results of this study underscore the need for consistent long-term data on biologically relevant environmental variables that scientists can use to analyze changes in key biological populations. This type of data and subsequent analysis will be needed to help us to understand the influences of human-caused environmental stressors and corrective actions.